

### SPECIFICATION AMENDMENT

1. Please replace the paragraph beginning at line 8 page 3 with the following amended paragraph:

A method of assigning transmitters to ~~receive receiver~~ antennas in tire pressure monitoring systems is known from EP-B-0 861 160, in which a pressure measurement sensor, a transmitter and a send antenna are each assigned to a wheel. In addition each wheel is assigned a ~~receive receiver~~ antenna on the bodywork which is connected via a cable in each case to the receiving and evaluation electronics. The assignment of the identifiers to wheel positions is made by a signal sent from a transmitter or from the associated transmit antenna being received by all ~~receive receiver~~ antennas and that the (wheel) position of the ~~receive receiver~~ antenna which delivers the signal with the greatest intensity is assigned to the corresponding transmitter and its identifier.

2. Please replace the paragraph beginning at line 17 page 3 with the following amended paragraph:

The disadvantage here is that each wheel position must be assigned a ~~receive receiver~~ antenna, which in its turn must be connected via a corresponding cable to the receiving and evaluation electronics. This brings corresponding installation effort and correspondingly high costs for the number of ~~receive receiver~~ antennas corresponding to the number of wheels.

3. Please replace the paragraph beginning at line 22 page 3 with the following amended paragraph:

A system for recording tire pressures is known from US 5,774,047, in which a detector unit with a transmitter is also assigned to each wheel. The transmit signals are evaluated and assigned to the wheel positions by providing at least two ~~receive receiver~~ antennas, whereby the phase difference and polarity of the two receive signals in each case is evaluated, which is delivered by the at least two ~~receive receiver~~ antennas on receiving the signal of one and the same transmitter.

4. Please replace the paragraph beginning at line 10 page 4 with the following amended paragraph:

The invention may achieve this object by an arrangement to monitor at least one parameter for a number of motor vehicle wheels, comprising a number of detector units, each of which is assigned to a wheel, whereby each detector unit comprises a sensor for recording the at least one parameter and a transmit unit with a transmit antenna, at least one ~~receive receiver~~ antenna comprising a directional characteristic positioned in such a way in the vehicle that, in connection with the field strengths of the signals sent by the individual transmit units at the location of the at least one ~~receive receiver~~ antenna produces receive signals of different power in each case for at least two of the transmit units, a central evaluation unit which comprises a receive unit, wherein the receive unit is connected to the at least one ~~receive receiver~~ antenna; and an evaluation unit coupled with the central evaluation unit which compares the receive power of a received ~~signals signal~~ with stored threshold values or ranges of values assigned to one wheel position in each case and assigns the received signal to a wheel position, if the threshold value assigned to this wheel position is exceeded or the receive power lies within the range of values assigned to this wheel position.

5. Please replace the paragraph beginning at line 1 page 5 with the following amended paragraph:

The directional characteristic of the at least one receive receiver antenna may be created such that, starting from the position of the receive receiver antenna, they each produce sensitivities in the direction of the transmit antennas of the at least two signals to be distinguished of the relevant transmit units, for which the difference is greater than a predefined value, in which case this value is selected to enable a clear distinction to be made between the signals using the detected receive power of the two signals. For a vehicle with four wheels two receive receiver antennas may be provided. One receive receiver antenna may be provided in a position in the area of the front wheel and one receive receiver antenna may be provided in a position in the area of the rear wheel, preferably in the area above the wheel arch. The directional characteristic of the receive receiver antenna at least in the direction of the further wheel of the same lengthwise side of the vehicle may show a low or high sensitivity and in the direction of the further front or rear wheel a high or low sensitivity, so that the evaluation unit can use one receive receiver antenna in each case to undertake at least one unique assignment of the signals of the transmit units at the wheel positions in the direction of the low and high sensitivity. The directional characteristic of the receive receiver antennas may be created so that the signal of the transmit unit in the area of the same wheel creates the highest receive power in each case, which is clearly distinguishably higher than the receive power on reception of a signal from the transmit unit in the direction of the high sensitivity of the directional characteristic. The transmit antennas or the entire transmit units or detector units may be identical in design. In the receive unit there may be provision for a further receive receiver antenna and the receive unit may be positioned adjacent to a transmit unit in such a way that this receive receiver antenna receives the signal of the adjacent transmit unit with the greatest signal power. The evaluation unit may

undertake the assignment of the signals to wheel positions on request or at regular intervals as part of an assignment mode and when doing so may assign a characteristic identifier for the detected wheel position transmitted by one of the transmit units in each case and may store it and wherein the evaluation unit in normal operation assigns the received signals to the wheel positions using a comparison between the identifier transmitted by the transmit units and the stored assignment information (identifier for wheel position). The receive unit may comprise a controllable switch that in each case connects one of a number of ~~receive receiver~~ antennas with downstream components of receive unit.

6. Please replace the paragraph beginning at line 5 page 6 with the following amended paragraph:

The object can also be achieved by a method for monitoring at least one parameter for a number of motor vehicle wheels, comprising the steps of :

- recording the at least one parameter;
- transmitting the at least one parameter with a transmit antenna,
- positioning of at least one ~~receive receiver~~ antenna in such a way in the vehicle that, in connection with the field strengths of the signals sent by the individual transmit units at the location of the at least one ~~receive receiver~~ antenna produces receive signals of different power in each case for at least two of the transmit units; and
- comparing the receive power of a received ~~signals signal~~ with stored threshold values or ranges of values assigned to one wheel position in each case and assigning the received signal to a wheel position, if the threshold value assigned to this wheel position is exceeded or the receive power lies within the range of values assigned to this wheel position.

7. Please replace the paragraph beginning at line 18 page 6 with the following amended paragraph:

The method may further comprise the step of starting from the position of the receive receiver antenna, distinguishing at least two signals of the relevant transmit units by producing sensitivities in the direction of each of the transmit antennas, for which the difference is greater than a predefined value, in which case this value is selected to enable a clear distinction to be made between the signals using the detected receive power of the two signals. The method may further comprise the step of providing one receive receiver antenna in a position in the area of a front wheel and one receive receiver antenna in a position in the area of a rear wheel, preferably in the area above the wheel arch. The directional characteristic of the receive receiver antenna at least in the direction of the further wheel of the same lengthwise side of the vehicle may show a low or high sensitivity and in the direction of the further front or rear wheel a high or low sensitivity, so that the evaluation unit can use one receive receiver antenna in each case to undertake at least one unique assignment of the signals of the transmit units at the wheel positions in the direction of the low and high sensitivity. The method may further comprise the step of creating the directional characteristic of the receive receiver antennas in such a way that the signal of the transmit unit in the area of the same wheel creates the highest receive power in each case, which is clearly distinguishably higher than the receive power on reception of a signal from the transmit unit in the direction of the high sensitivity of the directional characteristic. The method may further comprise the steps of providing for a further receive receiver antenna in the receive unit and positioning the receive unit adjacent to a transmit unit in such a way that this receive receiver antenna receives the signal of the adjacent transmit unit with the greatest signal power. The evaluation unit may undertake the assignment of the signals to wheel positions on request or at regular intervals as part of an assignment mode and when doing so may assign a characteristic identifier for the detected wheel position transmitted by one of the transmit units in each case and stores it and the evaluation unit in normal operation may assign the received signals to the wheel positions using a comparison between the identifier transmitted by the transmit units and the stored assignment information (identifier for wheel position). The method may further comprise the step of connecting one of a

number of ~~receive~~ receiver antennas with downstream components of the receive unit by means of a switch.[[.]])

8. Please replace the paragraph beginning at line 22 page 7 with the following amended paragraph:

The starting point for the invention is the knowledge that the assignment of a receive signal to the wheel position (or vice-versa) can be achieved in a simple manner by using at least one ~~receive~~ receiver antenna which features a directional characteristic such that signals sent in conjunction with the field strengths of the signals sent by the individual transmitters at the location of at least one ~~receive~~ receiver antenna produce receive signals of different powers for at least two transmit units to be distinguished. This means that it is sufficient to simply compare each signal level with stored assignment information to allow the received signal to be assigned to the corresponding wheel position. The stored assignment information comprises a threshold value assigned to each wheel position in each case or a range of values assigned to a wheel position in each case for the receive signal power or the level (voltage) of the receive signal.

9. Please replace the paragraph beginning at line 6 page 8 with the following amended paragraph:

In this case the directional characteristic of the at least one ~~receive receiver~~ antenna can be designed in such a way that the receive characteristic in each direction, starting from the position of the receiver antenna in the direction of the wheel concerned or the position of the detector unit located on it shows a markedly different sensitivity in each case. This would make it possible using a single antenna, to distinguish between all signals of for example four detector units of the vehicle with four wheels.

10. Please replace the paragraph beginning at line 13 page 8 with the following amended paragraph:

According to the preferred form of embodiment of the invention, two ~~receive receiver~~ antennas are provided for a vehicle with four wheels. The preferred configuration here is one receiver antenna in the area of one front wheel and one ~~receive receiver~~ antenna in the area of one rear wheel. The directional characteristic of the two ~~receive receiver~~ antennas can be designed so that in the direction of the other wheel on the same side of the vehicle there is a low (high) sensitivity and in the direction of the other front or rear wheel a high (low) sensitivity.

11. Please replace the paragraph beginning at line 23 page 8 with the following amended paragraph:

With a further form of embodiment of the invention the directional characteristic of the ~~receive receiver~~ antenna is further created in such a way or the ~~receive receiver~~ antenna aligned in relation to the wheel position, in whose environment the ~~receive receiver~~ antenna is arranged such that the signal of the detector unit assigned to the wheel at this wheel position generates the highest receive power. This receive power should be distinctly and identifiably higher than at the receive power on receipt of a signal from the transmit unit in the direction of high sensitivity of the directional characteristic of the relevant ~~receive receiver~~ antenna.

12. Please replace the paragraph beginning at line 5 page 9 with the following amended paragraph:

The benefit produced in this way is that by using the one antenna the signals of three detector units can be uniquely assigned to the wheel positions concerned. This similarly applies to the other ~~receive receiver~~ antenna. In this case the redundancy provided (a number of wheel positions can be assigned using both the one and the other ~~receive receiver~~ antenna) enables higher security to be guaranteed for the assignment.

13. Please replace the paragraph beginning at line 16 page 9 with the following amended paragraph:

In the evaluation unit a further ~~receive receiver~~ antenna can be provided which can also feature a defined directional characteristic in relation to the wheel positions. This additional ~~receive receiver~~ antenna then serves as a redundant unit and can be included for checking and if necessary correcting the assignment results.

14. Please replace the paragraph beginning at line 4 page 10 with the following amended paragraph:

In accordance with the preferred form of embodiment of the invention the central evaluation unit or the receive unit included in it features a controllable switch which in each case connects one of the number of ~~receive receiver~~ antennas to the downstream components of the receive unit or the evaluation unit.

15. Please replace the paragraph beginning at line 8 page 10 with the following amended paragraph:

Brief Description of the Drawings

The invention is described in more detail below on the basis of the exemplary embodiments shown in the drawing. The drawings show

- Fig. 1** a schematic diagram of a vehicle with a first form of embodiment of an arrangement for monitoring at least one parameter of the four vehicle wheels;
- Fig. 2** a schematic diagram of a vehicle with a second form of embodiment of an arrangement for monitoring at least one parameter of the four vehicle wheels;
- Fig. 3** a schematic diagram of the directional characteristic of a simple dipole-type **receive receiver** antenna; and
- Fig. 4** a simplified diagram of the directional characteristic of an additional antenna to be positioned in the central evaluation unit.

16. Please replace the paragraph beginning at line 22 page 10 with the following amended paragraph:

Detailed Description of the Preferred Embodiments

The schematic diagram of a vehicle 1 in Fig. 1 shows the vehicle with an arrangement 3 to monitor at least one parameter for a number (in the example shown, four) of vehicle wheels. The arrangement 3 comprises a total of four detector units 5, whereby one detector unit 5 is assigned to a vehicle wheel 7 in each case. Each detector unit 5 includes a transmitter unit which has not been shown in more detail, which for its part features a transmit antenna in each case. The detector units 5 are preferably designed to be identical for practical reasons.

17. Please replace the paragraph beginning at line 5 page 11 with the following amended paragraph:

Arrangement 3 further comprises two ~~receive receiver~~ antennas 9, whereby in the exemplary embodiment shown in Fig 1 one ~~receive receiver~~ antenna 9 is positioned in the area of the front left vehicle wheel 7 and one ~~receive receiver~~ antenna 9 in the area of the rear left vehicle wheel 7 in a fixed position. To aid clarity the diagram in Fig 1 does not show the vehicle wheels on the left-hand side of the vehicle. Instead of the directional characteristic of the ~~receive receiver~~ antenna 9 are shown schematically.

18. Please replace the paragraph beginning at line 13 page 11 with the following amended paragraph:

The ~~receive receiver~~ antennas 9 are connected to the receive unit 15, in which case the receive unit 15 features a controllable switch 17 which directs the signal of a ~~receive receiver~~ antenna 9 in each case to the further components of the receive unit 15.

19. Please replace the paragraph beginning at line 16 page 11 with the following amended paragraph:

The relatively simple directional characteristic of ~~receive receiver~~ antenna 9 shown in Fig. 1 and in greater detail in Fig. 3 provide the opportunity, in conjunction with a selected position and alignment of the ~~receive receiver~~ antennas ~~nine 9~~, to distinguish between the transmit signals of detector units 5 in the wheel positions A, B, C, D.

20. Please replace the paragraph beginning at line 20 page 11 with the following amended paragraph:

Given an identical design of detector units 5, the following relationships between the receive powers all signal levels P of the receive signals for transmit signals of the detector units in the wheel positions A, B, C, D will be produced for ~~receive receiver~~ antenna and 9 in the assigned Position I which is adjacent to wheel position A:

$P_I(A) > P_I(B) > P_I(C) > P_I(D)$

21. Please replace the paragraph beginning at line 1 page 12 with the following amended paragraph:

For the ~~receive receiver~~ antenna 9 in the antenna Position II, which is adjacent to wheel position D, the following relationships between the receive signal levels P for transmit signals which are created by the detector units 5 in the wheel positions A, B, C, D are produced in a similar way:

$P_{II}(D) > P_{II}(C) > P_{II}(B) > P_{II}(A)$

22. Please replace the paragraph beginning at line 6 page 12 with the following amended paragraph:

Since the spacing of the vehicle wheels in the longitudinal direction is as a rule greater than the spacing of the wheels on a vehicle axle, even with the selected receive characteristic the signals  $P_I(B)$  und  $P_I(C)$  or the receive signals  $P_{II}(C)$  and  $P_{II}(B)$  can still be identified although the sensitivity of the simple dipole characteristic selected in the example in the chosen receive direction is still relatively similar.

23. Please replace the paragraph beginning at line 11 page 12 with the following amended paragraph:

Of course the directional characteristic of the ~~receive receiver~~ antenna 9 can be designed so that the sensitivity in these directions differs markedly, so that in this way it is possible to make an even more secure distinction of the receive signals of the detector units located in these wheel positions.

24. Please replace the paragraph beginning at line 18 page 12 with the following amended paragraph:

It should be pointed out first of all that this type of distinction or assignment of a received signal can of course be undertaken before or during each reception of a signal sent by a detector unit 5. Instead of this however the preferred method is to use an assignment or initialization process that can be executed by the central evaluation unit 11 on request or at pre-specified intervals that investigates each of the detector units 5 in turn to see the wheel position A, B, C, D at which these are located and to store this information assigned to a characteristic identifier for the detector unit concerned in the central evaluation and control unit 11. After termination of the assignment process the assignment can then be made in the normal operating mode of arrangement 3 in which the identifier of a receive signal is merely detected and compared with the stored assignment information. Normal operating mode does not require any switch-over of the receive receiver antennas either. Instead it is sufficient to detect the receive receiver antennas of all four detector units 5 with one and the same receive receiver antenna 9.

25. Please replace the paragraph beginning at line 7 page 13 with the following amended paragraph:

If an assignment of the receive signals to wheel positions is to be undertaken – whether as part of an assignment or initialization process or on receipt of each signal in the normal operating mode - , switch 17 is first used to connect a receive receiver antenna with the receive unit 15 and the relevant signal level is determined. In a next step switch 17 is connected with the other receive receiver antenna 9 and the level of the receive signal as a result of receiving a this same signal with this receive receiver antenna 9 is determined. The evaluation unit 13 then investigates (or each receive level after it is established), whether this receive level exceeds a threshold that is assigned to the relevant wheel positions A, B, C, D or whether this level lies within range of values assigned in one of the relevant wheel positions. If for example the receive level  $P_1$  of a signal which is delivered by a receive receiver antenna 9 in position I exceeds a threshold value which is assigned to wheel position B but not the threshold value which is assigned to wheel position A, the receive signal of wheel position B is assigned. Thus the process for assigning a signal in the normal operating phase is ended. If an assignment or initialization process is undertaken, the identifier of the signal concerned is detected and stored as assignment information assigned to the relevant wheel position. Furthermore these steps are executed in an assignment or initialization process for the signals sent by all the detector units.

26. Please replace the paragraph beginning at line 25 page 13 with the following amended paragraph:

Since both receive receiver antennas 9 at least theoretically allow a unique assignment of a signal as a result of the selected directional characteristic, the evaluation units 13 cannot just undertake assignment of the signal as a result of the level of receive receiver antenna 9 in position I, but also an assignment of the signal by investigating the level  $P_{II}$  that is delivered by the receive receiver antenna 9 in position II. This redundancy produces increased safety.

27. Please replace the paragraph beginning at line 7 page 14 with the following amended paragraph:

In the same way the receive signals that are delivered by the ~~receive receiver~~ antennas 9 in position I or II are only used for the assignment of specific wheel positions, for example those wheel positions that can be distinguished and assigned with the greatest reliability.

28. Please replace the paragraph beginning at line 11 page 14 with the following amended paragraph:

The further exemplary embodiment shown in Fig. 2 differs from the configuration shown in Fig. 1 merely in that the ~~receive receiver~~ antennas 9 on opposite lengthwise sides of the vehicle are positioned in the area of the front or rear wheel arch.

29. Please replace the paragraph beginning at line 15 page 14 with the following amended paragraph:

With this form of embodiment it is possible, as mentioned previously, to only use ~~receive receiver~~ antenna 9 in position I for assigning a receive signal to the wheel positions B and C. As a result of the simple directional characteristic there is the danger that the signals of the detector units in wheel positions A and D will only differ slightly in their receive level. These wheel positions can however be securely assigned by evaluating the receive signal supplied by ~~receive receiver~~ antenna 9 in position II. For the form of embodiment shown in Fig. 2 the following equation for the relationships of the receive level is produced for ~~receive receiver~~ antenna 9 in position I:

$$P_I(B) > P_I(A) > P_I(D) > P_I(C)$$

30. Please replace the paragraph beginning at line 1 page 15 with the following amended paragraph:

For ~~receive receiver~~ antenna 9 in position II the equation described here is produced for the form of embodiment in accordance with Fig. 1 is produced for the receive level.

31. Please replace the paragraph beginning at line 4 page 15 with the following amended paragraph:

Furthermore in Fig. 2 in the receive unit 15 itself there is provision for a further ~~receive receiver~~ antenna 19 which is preferably implemented on a printed circuit board of the circuit of receive unit 15. This ~~receive receiver~~ antenna can for example feature the directional characteristic shown in Fig. 4. If this ~~receive receiver~~ antenna, as shown in Fig. 2, is aligned with its directional characteristic to position A, the relevant receive signal can be used to control the functional capabilities of the entire arrangement in evaluating the signals of the ~~receive receiver~~ antenna 9. The further antenna can however also be aligned to one of the remaining wheel positions. Overall the further ~~receive receiver~~ antenna 19 increases the redundancy of the arrangement and thereby with a suitable evaluation the security of the assignment of the wheel positions A, B, C, D to the receive signals.

32. Please replace the abstract at page 22 with the following amended abstract:

**Abstract**

The arrangement for monitoring at least one parameter for a number of motor vehicle wheels uses at least one ~~receive~~ receiver antenna that features a directional characteristic such that at least the signals which are transmitted by detector units located at two different vehicle wheels can be uniquely assigned to the relevant wheel positions as a result of the different receive level. The use of a number of ~~receive~~ receiver antennas allows either the number of distinguishable detector units to be increased or a redundancy to be created to improve the reliability of the detection.